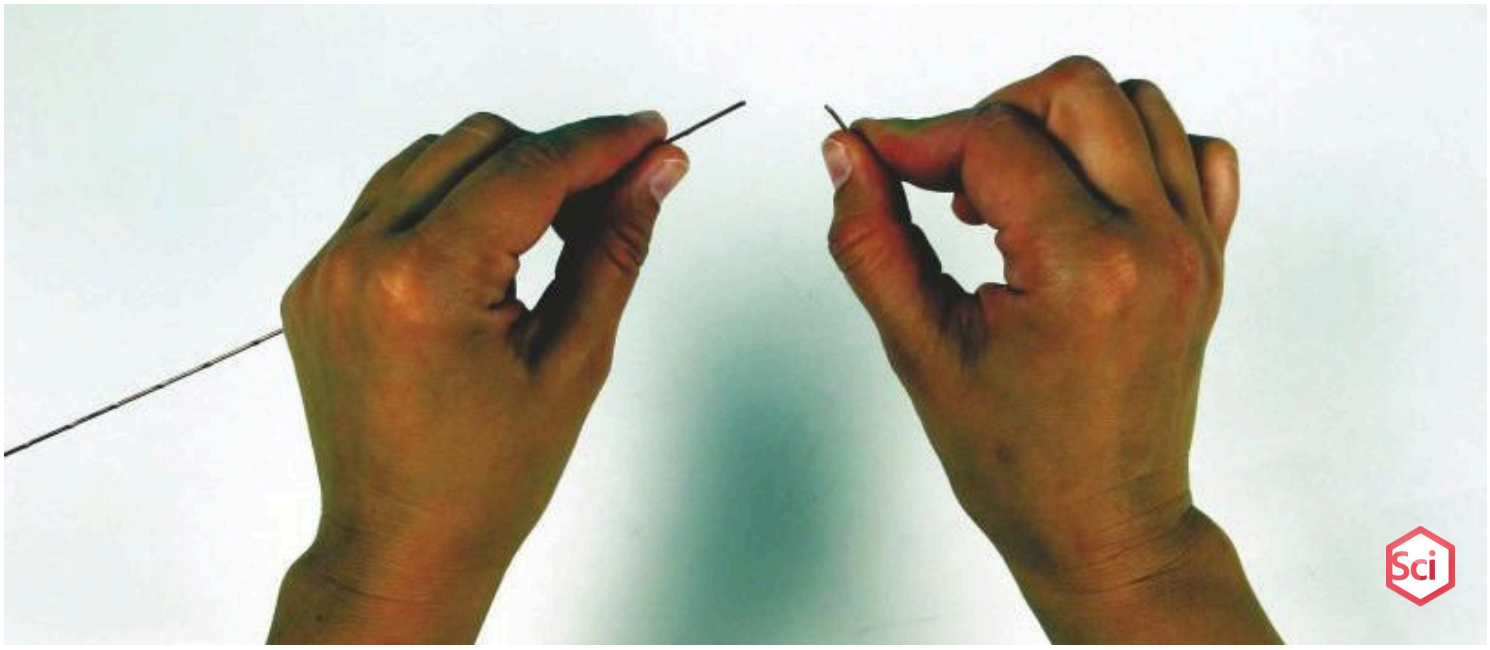
Fragmentation of magnets



Nature & technology > Devices & machines in everyday use

Difficulty level	Group size	Preparation time	Execution time
hard	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/6088f8d5c5d4ad0003790bfb

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Teacher information

Application

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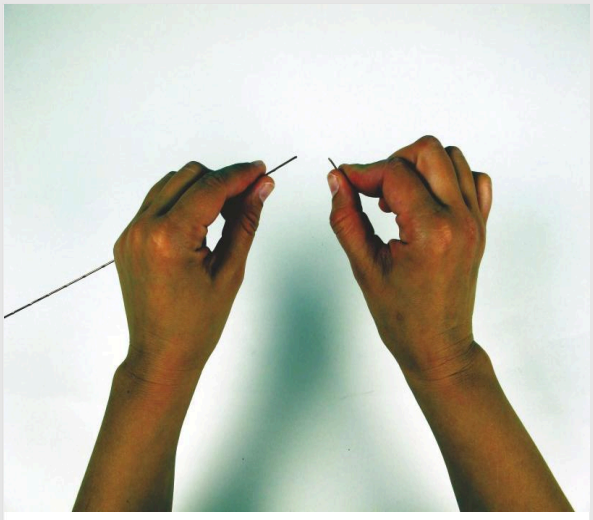

Cutting a magnetized iron wire

Each magnet has two poles (north and south pole), at which the strongest attraction is effective. The magnet becomes thereby in all directions in the space.

What happens if you break the magnet in half? Do you then have a single north pole and a separate south pole?

Students investigate the properties of a magnetized iron wire after it has been divided. They observe that all parts are still magnetized and each has a north and south pole. They conclude that there are several separate magnets, so the magnet has not been divided into separate north and south poles, but into magnets again.

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Other teacher information (1/2)

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Previous knowledge

- Students should already know that a magnet has two poles, a north pole and a south pole.
- They should also have a rough understanding of how magnetizing an iron wire works.

Principle

- A magnet consists of many tiny elementary magnets that are aligned in such a way that a north and a south pole are formed.
- By dividing a magnet, the elementary magnets realign themselves and the individual parts retain the properties of a magnet.

Other teacher information (2/2)

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Learning objective

- The individual parts of a broken magnetized iron wire retain the properties of a magnet.
- They still have a north and a south pole.

Tasks

- Students will magnetize a long iron wire and break it into several small pieces.
- They then investigate how the small pieces of wire interact with each other.

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Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

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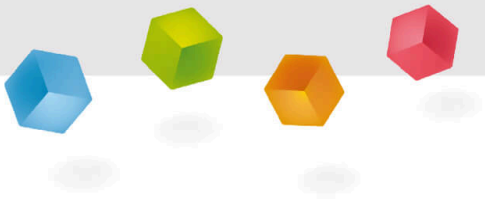

Student Information

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Motivation

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Still being researched!

You have already found out that a magnet has two poles, namely a north and a south pole.

What happens if you break the magnet in half? Do you then have a single north pole and a separate south pole?

This question is not easy to answer, even today many scientists are researching this!

In the experiment you will get a certain result, but maybe you will also wonder if there is no other way?

Tasks

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- Magnetize a long iron wire and then break it into several small pieces. Examine how the small pieces of wire interact with each other.
- Before you start the experiment, think about what would happen if you took a magnet and broke it in half.
- Note down your experimental observations and answer the questions in the protocol.

Opening question

What happens if you take a magnet and break it in half?

Two new magnets are created, each with a north and a south pole.

The magnet doesn't work anymore.

One piece is the North Pole, the other piece is the South Pole.

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Equipment

Position	Material	Item No.	Quantity
1	Magnet, d=8 mm, l=60 mm	06317-00	1
2	Iron wire, 5 pcs.	326875	1

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Equipment

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Position	Equipment	Quantity
1	Paper clips	3

Procedure (1/2)

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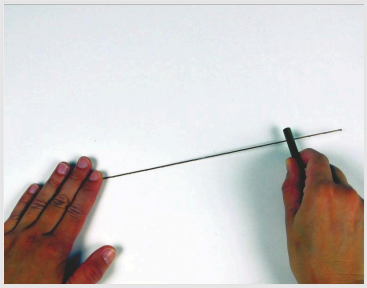

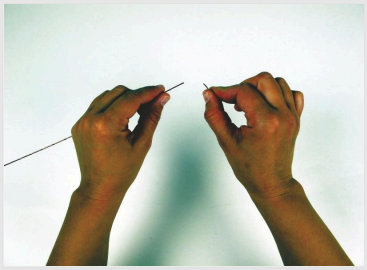

- Magnetize the iron wire by running one end of the magnet lengthwise over the whole wire several times as shown in the picture above left.
- Now break off small pieces of the iron wire one after the other at the notches as shown in the picture below left.
- Put all the broken pieces of wire on the table.
- Take one of the pieces in your hand and touch it to another piece of wire. Keep doing this until you have touched all the pieces.
- Note in the protocol how the individual pieces of wire behaved.

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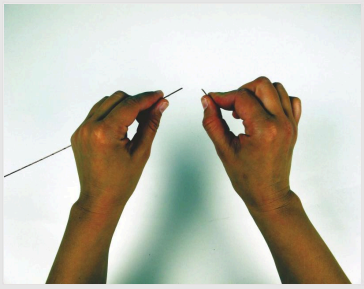
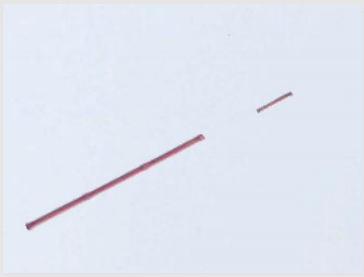
Procedure (2/2)





- Take two of the broken pieces of wire. Put one on the table and take the other in your hand.
- Now bring the ends of the wire pieces together.
- Check to see if all ends attract or if any repel.

Report

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Task 1

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Now that you have done the experiment, answer the introductory question again: What happens if you take a magnet and break it in half?

- One piece is the North Pole, the other piece is the South Pole.
- Two new magnets are created, each with a north and a south pole.
- The magnet doesn't work anymore.

Task 2

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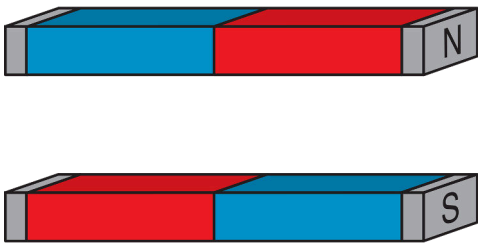
If you hold two broken pieces together, do all the ends pull on each other?

- Yes. The end of one piece of wire attracts both ends of the other piece of wire.
- No! The end of one piece of wire attracts only one of the ends of the other piece of wire, the other repels it.



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Task 3

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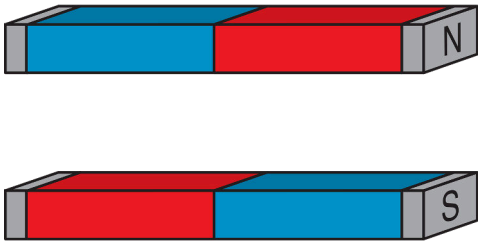
What are the poles of the broken (magnetized) metal wire?

- East and West Pole
- North and West Pole
- North and South Pole
- South and East Pole



Slide	Score / Total
Slide 8: Breaking a magnet	0/1
Slide 14: Breaking a magnet	0/1
Slide 15: Attraction of broken magnets	0/1
Slide 16: Poles of a broken metal wire	0/1

Total 0 / 4

Solutions Repeat

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